(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 405 564 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.04.2004 Bulletin 2004/15

(51) Int Cl.[7]: **A22B 3/08**

(21) Application number: **03021509.9**

(22) Date of filing: **24.09.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **01.10.2002 DK 200201466**

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(54) Method and system for gas stunning of poultry for slaughter

(57) A method and a system (2) for gas stunning of poultry for slaughter is described, where poultry arrives at the poultry slaughterhouse in transport crates (6), where gas stunning of the animals is effected while they are still in transport crates (6), and where the transport crates with the animals, by means of a number of conveyors (12, 14, 18, 20), are conveyed successively through a stunning chamber (8), where the action of the gas for stunning of the animals is adjusted by shortening or prolonging the conveying time and/or the conveying route of the said transport crates (6) through the stunning chamber (8). It has surprisingly appeared that by means of such simple measures it is possible to optimise stunning while at the same time considering all the said parameters. If the stunning condition of the animals is not optimum, it will be easy to prolong or shorten the conveying time and/or the conveying route through the stunning chamber.

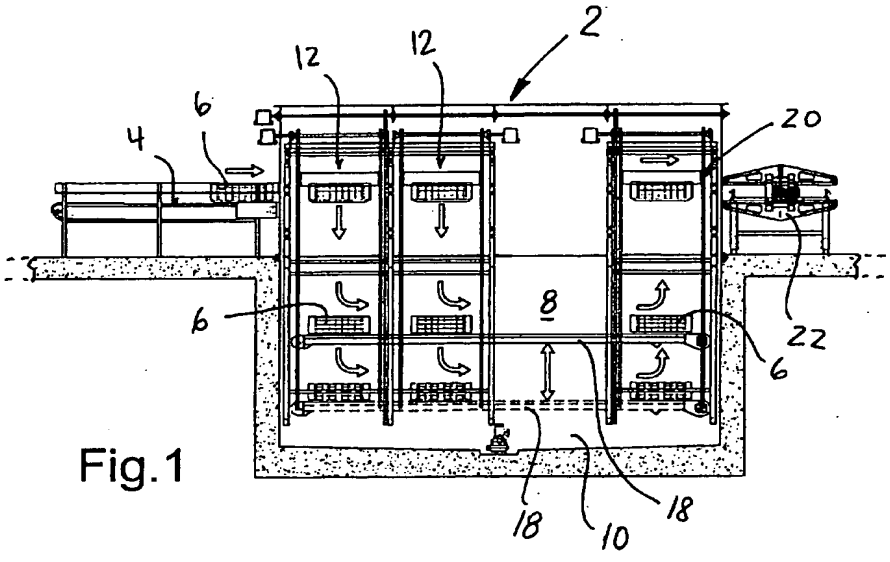

Fig.1

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Description

FIELD OF INVENTION

[0001] The present invention relates to a method for gas stunning of poultry for slaughterand of the kind stated in the preamble of claim 1.

PRIOR ART

[0002] Over time, many different methods have been proposed for gas stunning of poultry for slaughter arriving at the poultry slaughterhouse in transport crates, with no remarkable success. In practice however, several parameters must be considered in order to be able to optimise a method for gas stunning of poultry for slaughter.

[0003] To optimise the method, the following parameters must be considered:

- Conveying speed (capacity of the system)
- Size and number of birds in the transport crates.
- The physical condition of the poultry flock which is determined by continuously observing variations in stress condition or resistance of the poultry that are significant for determining the time necessary for stunning the poultry which further may vary because of conditions in broiler houses, temperatures, transport time, and waiting time in the slaughterhouse.

[0004] To optimise the gas stunning it is furthermore necessary to be able to continuously consider all these parameters prior to and during gas stunning of the poultry supplies delivered to the slaughterhouse, and continuously apply the most advantageous parameters to achieve optimum gas stunning of the actual chicken flock at any time to be stunned and slaughtered, respectively.

[0005] To optimise these parameters, different periods of stunning time can be used, but variations in the gas concentration, and variations of gas concentration in the different sections of the conveying route must also be taken into account, depending on the transport route length and transport route location in the stunning chamber.

[0006] The gas concentration may be monitored and controlled by means of sensors having different locations, and a PLC control system. Adjustment of the stunning time and concurrent variation of the gas concentration requires a change in the previously used methods by which a given slaughtering capacity of number of birds per minute required a fixed conveying time through stunning chamber. A given rate of slaughtering (slaughtering capacity) will always be determined by other subsequent parameters that cannot be changed right away why they are maintained. Consequently it may furthermore be necessary to be able to change the degree of stunning, depending on the condition of the poultry upon arrival at the slaughterhouse and unloading for slaughter.

PURPOSE OF INVENTION

[0007] On this background it is the purpose of the invention to provide an improved method for gas stunning of poultry for slaughter, which method by means of simple provisions and means makes it possible to optimise the stunning by being able to consider all the mentioned parameters.

BRIEF DESCRIPTION OF INVENTION

[0008] The method according to the invention is characterised in that the influence of the gas for stunning of the animals is adjusted by shortening or prolonging the conveying time and/or the conveying route of the said transport crates through the stunning chamber. It has surprisingly appeared that by means of such simple provisions it is possible to optimise the stunning, and at the same time consider all the said parameters. As an especially important thing it should be mentioned that at the same time it is possible to consider the welfare of the animals by observing the stunning condition of the animals before they reach the actual slaughter. If the stunning condition of the animals is not optimum, it will be easy to prolong or shorten the conveying time and/or conveying route through the stunning chamber.

[0009] An optimum condition of stunning will be that the animals are so well stunned that they with certainty do not awaken before they reach slaughtering. On the other hand it is also important that the animals do not die in stunning because it is important that the pump function of the heart is maintained in order to contribute to the pumping out of blood when the necks of the animals are cut in the actual slaughter.

[0010] By the invention a method is appropriately used by which the adjustment of the conveying time through the stunning chamber is effected by increasing or reducing the speed of the said conveyors.

[0011] By the method according to the invention it may furthermore be advantageous that the adjustment of the

conveying route through the stunning chamber is effected by lowering or lifting a substantially horizontal conveyor running herein, which conveyor provides for the conveying of the transport crates between a downwards running conveyor and an upwards running conveyor.

[0012] Furthermore, the method according to the invention may be modified in such a way that the influence of the gas for stunning of the animals moreover is adjusted by varying the gas concentration at varying heights in the stunning chamber in that increasing gas concentration is appropriately applied in a direction downwards in the stunning chamber.

[0013] The invention furthermore relates to a system for gas stunning of poultry for slaughter cf. to the method according to the invention, and comprising a substantially horizontal conveyor which is arranged for receiving and introducing transport crates comprising poultry for slaughter to a gas-filled stunning chamber in which a downwards running conveyor is arranged, which is adapted for successively conveying transport crates downwards in the stunning chamber, and an upwards running conveyor, which is adapted for successively conveying the transport crates upwards and out of the stunning chamber, which system is characterised in that the downwards running conveyor is constituted by a number of substantially vertical conveyors each comprising mutually interacting endless chain conveyors with carrying means arranged for supporting opposite sides of said transport crates for downwards conveying of these in the stunning chamber, that the upwards running conveyor is constituted by a substantially vertical conveyor comprising mutually interacting endless chain conveyors with carrying means arranged for supporting opposite sides of said transport crates for upwards conveying of these from the stunning chamber, and that, between the said downwards and upwards running conveyors, there is a substantially horizontal conveyor adapted for providing the horizontal conveying of the transport crates through the stunning chamber, which latter conveyor furthermore is adapted as an entity for being lifted and lowered respectively between levels with varying gas concentrations in the stunning chamber.

[0014] Appropriately, the system according to the invention is provided in such a way that the stunning chamber is divided into a number of horizontal zones, e.g. three zones, viz. the lower zone having a gas concentration (CO^2) in the order of 50% (app. 45-51%), an intermediate zone having a gas concentration (CO^2) in the order of 25% (app. 32-46%), and an upper zone having a gas concentration (CO^2) in the order of 5% (app. 8-10%), in that sensors are provided in level with the upper zone limit for check and control respectively of the gas concentration in the said zones.

[0015] The actual gas concentration percentage varies a great deal in connection with shift between pause and operation, and upon changed rate of motion of the transport crates. This variation in the gas concentration has relatively small influence on the stunning result, whereas the time of presence, especially in the first zone, and the total time of presence in the stunning chamber have great influence.

[0016] The system according to the invention is preferably provided in such a way that it comprises a PLC control system for controlling of a number of mutually dependent mechanical parameters, e.g. speed of vertical conveyors, setting (176 seconds), number of transport crates in stunning zone, setting (tunnel) (10 pcs.), cycle between crates in stunning zone, setting (17.6 seconds), number of chickens per crate, setting (43 pcs.), speed of slaughtering line, setting (148 animals/minute), speed cycle between crates in stunning zones, actual (17.4 seconds), speed of slaughtering line, actual (142 animals/minute).

[0017] If one setting is changed, the other settings are changed correspondingly, e.g. if the birds are larger, it means that there are fewer animals in each transport crate, but the speed of the slaughtering line continues to be the same. Consequently it becomes necessary to convey more transport crates per minute through the stunning chamber, i.e. increased conveying speed. At the same time each individual bird is larger why it is stunned for a longer time, i.e. longer conveying time and conveying route respectively are required through the stunning chamber.

BRIEF DESCRIPTION OF DRAWING

[0018] The invention is explained in more details in the following with reference to the drawing in which

Fig. 1 shows a longitudinal sectional view through an embodiment of a system for gas stunning of poultry for slaughter according to the invention, and

Fig. 2 shows a transverse sectional view through a vertical conveyor of the system according to the invention shown in Fig. 1.

DETAILED DESCRIPTION OF INVENTION

[0019] The system 2 shown in Fig. 1 for gas stunning of poultry for slaughter comprises a supply conveyor 4 for supply to the stunning system 2 of standard transport crates 6 comprising live poultry, which for example arrive at the slaughterhouse by truck.

[0020] The stunning system 2 comprises a stunning chamber 8, the major part of which consists of a concrete pit 10 lowered in relation to the floor level, which chamber 8 is filled with stunning gas, by way of example. CO^2 with

varying gas concentrations, that is an upper, first zone having a gas concentration in the order of 5% (app. 8-10%), an intermediate, second zone having a gas concentration in the order of 25% (app. 32-46%), and a lower, third zone having a gas concentration in the order of 50% (app. 45-51%). The gas concentration in the respective zones is controlled by suitable gas sensors and an actually known gas filling/control system with belonging filling valves.

[0021] From the supply conveyor 4 the transport crates 6 are successively conveyed into a vertical downwards conveying conveyor 12, which, as shown most clearly in Fig. 2, consists of a number of mutually interacting endless chain conveyors 14 with carrying means 16, which are arranged for supporting opposite sides of the transport crates 6 for downwards conveying of these in the stunning chamber 8 until the transport crates 6 are transferred to a horizontal conveyor 18 arranged in a height displaceable way, which conveyor 18 provides for the transport crates 6 being re-transferred to a vertical upwards running conveyor 20 of the same type as the endless chain conveyors.

[0022] From the conveyor 20 the transport crates 6 comprising stunned poultry are transferred to a crate turning unit 22 which provides for turning the transport crates 6 for further conveying with the bottoms turning upwards on the conveyor for unloading of the stunned chickens and further conveying and shackling of these on slaughter line. Shortly after the stunned chickens have been shackled by their legs in slaughter shackles, the chickens pass a slaughter location where their necks are cut so that the chickens bleed out as the pumping function of their hearts is still intact if the gas stunning was optimum.

[0023] If it can be found that the gas stunning is either to deep, that is the chickens are already dead, the stunning must be adjusted by shortening the conveying route and/or conveying time through the stunning chamber so that the stunning becomes lighter. If the chickens on the contrary show signs of too light stunning, the stunning must likewise be adjusted so that the conveying route and/or conveying time through the stunning chamber are increased. In both situations, adjustment can be effected by lifting or lowering the horizontal conveyor 18 so that a simultaneous adjustment of the actual gas concentration is effected, which gas concentration is increasing in the downwards direction of the stunning chamber 8.

[0024] Sensors in a given location ensure that the horizontal conveyor 18 is in a correct position for example for small, medium-sized, or large chickens. An important thing which also influences the stunning result is that the transport crates 6 comprising chickens are conveyed downwards slowly step by step by means of the conveyor 12, starting in a low gas concentration of app. 5-10%. The stepwise downwards conveying ensures that the chickens at start and stop lift their heads whereby they can freely breathe in the relatively low gas concentration. This prevents the poultry from becoming stressed, and injuries are avoided.

[0025] To prolong the conveying time through the stunning chamber 8 downwards conveying by two or more conveyors 14 is also possible, while upwards conveying still is by only one conveyor 20 because the important thing is to reduce the time as much as possible that passes from full stunning until shackling in the slaughter shackles.

[0026] After the first part of the downwards movement, the poultry has "fallen asleep", and the crates continue further down where the gas concentration is max. 50% at the bottom of the chamber. Hereby it is ensured that the chickens will not wake up before their necks have been cut and they have bled out. As regards safety it is furthermore an advantage to lower the stunning chamber to below floor level so that gas leakage above head height is avoided.

[0027] In order to prevent excitement and stress of the poultry to be slaughtered it is important that the gas concentration at the beginning of the stunning is not too high. On the other hand it is also important to be able to work with an almost constant capacity of the stunning system by way of example a capacity of about 140 animals/minute so that the stunning system by large poultry may work with high conveying speed and possible longer conveying route and low gas concentration and by small poultry may work with low conveying speed and low gas concentration.

PLC control - displayed:	
Speed of stackers - Setting	176 seconds
Number of crates in tunnel - Setting:	10 pcs.
Cycle tunnel - Setting:	17.6 seconds
Chickens/crate - Setting:	43 pcs.
Line speed - Setting:	148 animals/minute
Speed cycle - Actual:	17.4 seconds
Speed - Actual:	142 animals/minute

CO^2 gas settings		
Tunnel zone 1	Setting: 5%	Actual: 8-10%
Tunnel zone 2	Setting: 25%	Actual: 32-46%

(continued)

CO^2 gas settings		
Tunnel zone 3	Setting: 50%	Actual: 45-51 %

Claims

1. A method for gas stunning of poultry for slaughter arriving at the poultry slaughterhouse in transport crates, where gas stunning of the animals is effected while they are still in transport crates, and where the transport crates comprising the animals, are conveyed successively by means of a number of conveyors through a stunning chamber, ***characterised*** **in that** the influence of the gas for stunning the animals is adjusted by shortening or prolonging the conveying time and/or the conveying route of the said transport crates through the stunning chamber.

2. A method according to claim 1, ***characterised*** **in that** the adjustment of the conveying time through the stunning chamber is effected by increasing or reducing the speed of the said conveyors.

3. A method according to claim 1, ***characterised*** **in that** the adjustment of the conveying route through the stunning chamber is effected by lowering or lifting a substantially horizontal conveyor running herein, which conveyor provides for the conveying of the transport crates between a downwards running conveyor and an upwards running conveyor.

4. A method according to claim 1, ***characterised*** **in that** the influence of the gas for stunning the animals is moreover adjusted by varying the gas concentration at varying levels in the stunning chamber as increasing gas concentration is applied in a downwards direction in the stunning chamber.

5. A system for gas stunning of poultry for slaughter cf. to the method according to claim 1 and comprising a substantially horizontal conveyor which is arranged for receiving and introducing transport crates comprising poultry for slaughter to a gas-filled stunning chamber in which a downwards running conveyor is arranged, which is arranged for successively conveying transport crates downwards in the stunning chamber, and an upwards running conveyor which is arranged for successively conveying the transport crates upwards and out of the stunning chamber; ***characterised*** **in that** the downwards running conveyor is constituted by a number of mainly vertical conveyors, each comprising mutually interacting endless chain conveyors with carrying means arranged for supporting opposite sides of said transport crates for downwards conveying of these in the stunning chamber, that the upwards running conveyor is constituted by a substantially vertical conveyor comprising mutually interacting endless chain conveyors with carrying means arranged for supporting opposite sides of said transport crates for upwards conveying of these from the stunning chamber, and that between the said downwards and upwards running conveyors there is a substantially horizontal conveyor arranged for providing the horizontal conveying of the transport crates through the stunning chamber, which latter conveyor furthermore is adapted as an entity for being lifted and lowered respectively between levels with varying gas concentrations in the stunning chamber.

6. A system according to claim 5, ***characterised*** **in that** the stunning chamber is divided into a number of horizontal zones, by way of example three zones, viz. a lower zone having a gas concentration (CO^2) of 50% (app. 45-51%), an intermediate zone having a gas concentration (CO^2) of 25% (app. 32-46%), and an upper zone having a gas concentration (CO^2) of 5% (app. 8-10%), as sensors are provided in level with the upper zone limit for monitoring and control respectively of the gas concentration in the said zones.

7. A system according to claim 5, ***characterised*** **in that** it comprises a PLC control system for controlling a number of mutually dependent mechanical parameters, by way of example speed of vertical conveyors, setting (176 seconds), number of transport crates in stunning zones, setting (tunnel) (10 pcs.), cycle between crates in stunning zone, setting (17.6 seconds), number of chickens per crate, setting (43 pcs.), speed of slaughtering line, setting (148 animals/minute), speed cycle between crates in stunning zone, actual (17.4 seconds), speed of slaughtering line, actual (142 animals/minute).

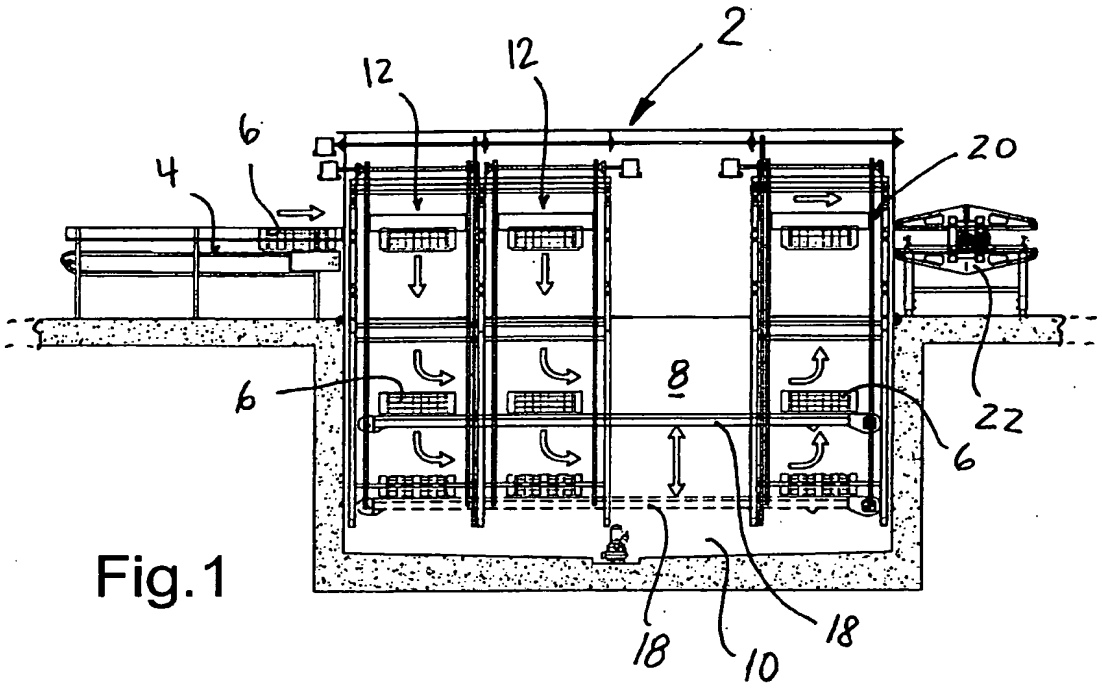

Fig.1

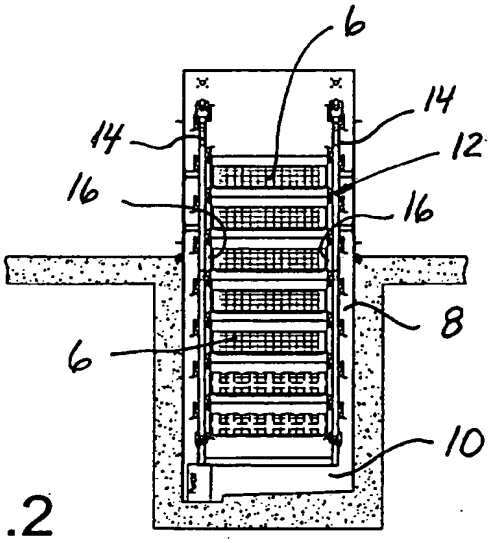

Fig.2

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 02 1509

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	5 January 2004	Acerbis, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 02 1509

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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